

AD-A162 147

COST ANALYSIS OF FEDERAL TELECOMMUNICATIONS SYSTEM
(FTS) VERSUS COMPARATI (U) ARMY INFORMATION SYSTEMS
COMMAND FORT HUACHUCA AZ D A LYALL 1985

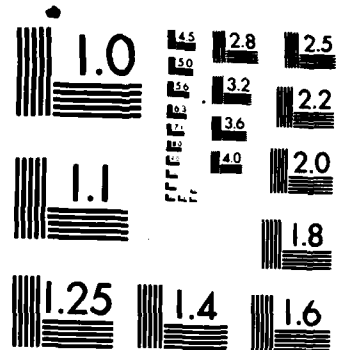
1/1

UNCLASSIFIED

F/G 17/2

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

AD-A162 147

Cost Analysis of the Federal Telecommunications System (FTS)

Versus Comparative

Wide Area Telephone Service (WATS)
At Selected Army CONUS Locations

by

Dale A. Lyall, Operations Research Analyst
HQ, U.S. Army Information Systems Command
AS-OC-SAS
Fort Huachuca, AZ 85635-5000

Presented at the
19th Annual Department of Defense
Cost Analysis Symposium
Xerox Training Center
Leesburg, Virginia
September 17 - 20 1985

DTIC
ELECTE
NOV 26 1985
S B D

DISTRIBUTION STATEMENT A

Approved for public release
Distribution Unlimited

11 20-85 050

ONE FILE COPY

I. INTRODUCTION

I-1. Objective. The objective of this study was to compare the costs of the Federal Telecommunications System (FTS) and Wide Area Telephone Service (WATS).

I-2. Background.

a. Army policy regarding installation and use of FTS has conformed to DOD policy, which was established by Congress. The House Appropriations Committee (HAC) stated in 1979, that "Expanded use of the FTS in lieu of commercial long distance telephone service could result in substantial savings and the HAC has directed DOD to proceed with FTS installation where cost effective."

b. Since the Congressional mandate to expand use of FTS, significant changes have occurred within the telephone industry. Telecommunications Package (TELPAC) rates for WATS have been eliminated. TELPAK provided for fixed cost for WATS access regardless of usage and it was the basis of the FTS network. The cost of providing FTS service to Army installations has risen from \$3.3M in FY 80 to about \$35M in FY 85. This is due to both increased usage of FTS and increased costs of the service.

c. During FY 84 program evaluations of Defense Metropolitan Area Telephone Systems (DMATS) at Boston, MA, and St. Louis, MO, management personnel at both sites argued that AT&T's WATS was less expensive than FTS.

d. In response to the changing environment, increased FTS costs, and the casual evidence that WATS may be more economical than FTS for Army long distance telephone service in some cases, an indepth comparison of FTS and WATS was initiated.

e. As the analysis progressed, the potential for Foreign Exchange (FX) applications was explored at several locations. Simply stated, FX trunks allow Army customers to make local calls to distant dialing areas.

I-3. Methodology.

a. A direct comparison of FTS and WATS costs was not possible because no historic FTS costs were available which could be specifically associated with particular locations or volumes of traffic. Therefore, the average cost per minute that the Army has paid for FTS service was used in the comparison. The average cost for FTS in FY 84 was \$0.263 per minute. Beginning in FY 85, the General Services Administration (GSA) initiated a new billing scheme resulting in an increase of the average cost per minute for Army FTS usage to \$0.322.

b. The procedure adopted to compare FTS and WATS costs was to cost FTS traffic using WATS tariffs, calculate the average cost per



For

I

a

ion

on

ity Codes

and/or

cial

PER FORM 5

A-1

minute for the equivalent WATS traffic, and compare the calculated WATS cost per minute to the average FTS charge. A sample of FTS traffic was obtained from GSA for 10 Army sites within CONUS. The traffic sample was provided on magnetic tape and because of the large volume of data and mathematical manipulations that must be performed on the data, an automated model was developed to facilitate the analysis.

II. SERVICE DEFINITIONS

II-1. FTS Defined.

a. FTS is a telecommunications service that is provided by GSA for the use of federal agencies. Army use of FTS is primarily that of long distance telephone service. Telephone service is extended to most areas within CONUS, Alaska, and Hawaii. The FTS consists of a core network of 34 major metropolitan areas within CONUS with service being extended to other areas on an off-net basis. Calls that both originate and terminate within the 34 city network are charged at the MCI WATS rate less a discount. All other calls are charged at the more expensive AT&T Direct Distance Dialing (DDD) rate less a discount. Few Army installations are located within one of the 34 core cities and those that are terminate only a small portion of their calls within the 34 city network. As a result, most Army FTS traffic is charged at the more expensive discounted DDD rates.

b. As a function of the underlying MCI WATS and AT&T DDD rate structures, FTS charges are sensitive to the distance between calling and called parties, time of day of call origination, and call length in minutes. FTS costs are also very sensitive to whether a call is on or off-net.

c. The FTS bill that is provided to the Army does not show the costs that are associated with each location. The originating call minutes for each installation is provided quarterly along with the cost for all Army FTS usage.

II-2. WATS Defined.

a. WATS is a special bulk rate service for directly dialed station to station calls. It is available in two formats, outward dialing only and inward dialing only (or 800 service). This study was limited to the analysis of OUTWATS although the potential exists for INWATS applications such as remote use of a central computer and recruiter functions.

b. OUTWATS service is offered to geographical areas surrounding the point of origination in terms of bands. Band 0 is the state of origination. Intrastate WATS can only be provided by the local and regional telephone companies in that area. Band 1 consists of the states that are adjacent to or very near the state of origin. Each successive WATS band from 2 through 6 provides an

increasingly large area of coverage. Band 5 provides service to all of CONUS. Service to Alaska and Hawaii is provided by band 6. Band 1 is the least expensive of the interstate WATS services but it also provides the smallest geographical area of service. Each successive band provides service to a larger geographical area at a higher cost.

b. The rate structure for band 0 WATS varies from state to state because intrastate rates are established by the public utilities commissions of the individual states. In addition to being a function of the WATS band selected, the cost of interstate WATS is dependent on the average monthly usage per trunk or line, the time of day that a call originates, length of the call in minutes, and to an extent, the state of origination. All other variables being equal, if a band 5 WATS trunk is used to make long distance calls, the cost of a call across the country would be the same as the cost of a call that terminates across the state line. For that reason, procurement of the optimum mix of WATS services and use of the most appropriate WATS band is critical in controlling the cost of WATS services. The hours of usage of a particular WATS band are averaged over the number of trunks of that band that are in service during the month and the average hours are costed on a decreasing scale so that as average usage increases, the average cost per hour decreases. WATS costs are sensitive to time of origination in the same way as residential long distance calls. Full daytime rates are applied from 0800 to 1700 Monday through Friday. Calls originating between 1700 and 2300 hours Sunday through Friday are priced at 65 percent of the daytime rate and calls originating during all other times of the week are priced at 35 percent of the daytime rate. Finally, the cost of WATS is sensitive to the state of origin. States located in the central part of CONUS have somewhat lower interstate WATS rates than coastal states since the maximum distance to termination points is somewhat shorter.

c. Other companies such as MCI and GTE offer services similar to WATS. At present, these services are priced in a manner that is akin to the FTS price structure in that calls that terminate on their existing networks are less expensive than calls that terminate offnet. Future cost comparisons that include these kinds of services will, of necessity, be complicated by the on and offnet considerations.

II-3. FX Defined. An FX trunk is a line that connects an Army telephone switch to a commercial switch in a distant city and allows Army customers to make local calls to that city. The FX applications that were explored in the analysis were intrastate and, as such, are regulated by the public utility commissions of the individual states. At present, most FX services are fixed cost regardless of traffic levels, however, some states allow for metering and variable charging for FX services.

III. COST ANALYSIS.

III-1. Model Overview.

a. To facilitate the cost comparison of FTS and WATS, an automated model was developed that performs traffic engineering (determines trunking requirements) and WATS costing. The model reads a file that contains a 20 percent sample of detailed records of actual calls that were placed from CONUS Army installations over the FTS network and calculates the cost of routing the same traffic over WATS trunks.

b. As each call record is read, originating and terminating telephone numbers are checked to determine the states of origination and termination and the minimum WATS band required to route the call. Call minutes are accumulated by band in the categories of day, evening, and night to allow for costing. Weekday hourly traffic is also accumulated to satisfy traffic engineering requirements.

c. Although interstate traffic is accumulated by each of the WATS bands 1 through 5, all interstate traffic is costed at the band 5 rate. Although this does not provide for optimum WATS costs, if the band 5 rate proves to be less costly than FTS, then certainly the optimum configuration of interstate WATS bands would be less expensive than FTS. The determination of the optimum mix of interstate WATS trunks is a very difficult problem; however, there are commercial models available to perform the task. The accumulation of FTS traffic into WATS bands will facilitate application of a commercial model in the future.

d. Intrastate and interstate trunking requirements are determined by examining weekday hourly traffic to determine the busy hour traffic level. The Erlang B formula is iterated with increasing numbers of trunks until the desired Grade of Service (GOS) is achieved. GOS is defined as the probability that a call placed during the busy hour will be blocked because all the trunks are busy. The Erlang B formula is shown below.

$$P = \frac{\frac{E^N}{N!}}{\sum_{X=0}^N \frac{E^X}{X!}}$$

Where:

P is grade of service (probability of blocking).

E is Erlangs (number of hours) of traffic in the busy hour.

N is the number of trunks required.

e. After the required number of trunks has been determined, average usage per trunk in the categories of day, evening, and night is calculated and costed using current WATS tariffs. Finally, the WATS cost per minute is established for comparison with the FTS per minute cost.

III-2. Results of Cost Analysis.

a. The model described in section III-1, above, was run for 10 Army CONUS locations and the resulting per minute costs are displayed in table III-1, below. The comparable cost per minute for FTS traffic is \$0.322.

TABLE III-1

COST SUMMARY

Cost Per Minute

| <u>Location</u> | <u>Intrastate</u> | <u>Interstate</u> | <u>Average</u> |
|-------------------|-------------------|-------------------|----------------|
| Fort Benning | \$0.168 | \$0.211 | \$0.202 |
| Bayonne MOT | 0.107 | 0.308 | 0.205 |
| Fort Knox | 0.280 | 0.241 | 0.254 |
| Fort Sheridan | 0.140 | 0.257 | 0.214 |
| Sacramento AD | 0.285 | 0.288 | 0.286 |
| Fort Dix | 0.080 | 0.258 | 0.189 |
| New Cumberland AD | 0.160 | 0.317 | 0.217 |
| Fort Bragg | 0.138 | 0.258 | 0.209 |
| Fort Hood | 0.138 | 0.213 | 0.192 |
| Fort Huachuca | 0.164 | 0.270 | 0.236 |

b. The potential for intrastate FX applications has been explored at Fort Huachuca, AZ, Fort Knox, KY, and the Tank and Automotive Command (TACOM) at Warren, MI. Cost per minute calculations for FX service are summarized in table III-2, below.

TABLE III-2

FX COST PER MINUTE

| <u>Origination</u> | <u>Destination</u> | <u>Cost/Min</u> |
|--------------------|--------------------|-----------------|
| Fort Huachuca | Tucson | \$0.03 |
| Fort Huachuca | Phoenix | 0.08 |
| Fort Knox | Elizabethtown | 0.05 |
| Fort Knox | Louisville | 0.02 |
| Warren | Mount Clemens | 0.04 |
| Warren | Detroit | 0.04 |

IV. OTHER ISSUES.

IV-1. Abuse of FTS. Distributions of FTS traffic by WATS bands in the day, evening, and night categories and busy hour traffic calculations indicated a high likelihood that the system was receiving considerable abuse. Much of the FTS traffic originated during the evening and night when very little Army related business is conducted. In fact, the busy hour at one installation occurred between 2200 and 2300 hours. The monthly FTS usage report that is provided by GSA is of little value in controlling abuse because, in most cases, the call originator is not identified. Also, the report contains only a 20 percent sample of calls and it is not available for every installation that has FTS access.

IV-2. Management of FTS and WATS. The management of long distance telephone services is currently split between the 7th Signal Command and the U. S. Army Commercial Communications Office (USARCCO). The 7th Signal Command is responsible for WATS procurement and management and USARCCO manages FTS and AUTOVON. FX requirements are identified by the individual Army sites and reported to the 7th Signal Command. Validation of cost effectiveness and procurement of FX is handled by USARCCO. The split in management responsibilities has led to some instances of installation of competing services rather than the optimum mix of the various services.

IV-3. Call Routing. Installation of the optimum mix of long distance telephone services does not ensure the Army of the lowest possible cost. For example, to call an adjacent state, band 5 WATS could be used, however, if band 1 WATS is available, it could be used to make the same call at a lower cost. Similarly, intrastate WATS can be used to call a nearby city but if FX service is available, it should be the service of choice. Since a given call destination may be reached via two or more available services, there must be some way to select the least costly service for each individual call. Customer education may help to ensure proper selection of telephone service but it is certainly not foolproof. During the study, numerous cases were found where FTS was used to call parties within the free local dialing area and FTS was even used to connect calls within the same Army installation and building. Effective use of available circuitry can only be ensured by physical means such as use of call routing hardware known as Least Cost Routers (LCR). LCR's examine the digits of the destination telephone number of each call and determine, using previously developed routing tables, which service should be selected to provide the lowest cost.

V. CONCLUSIONS AND RECOMMENDATIONS.

V-1. Conclusions:

a. The telephone system lacks controls to ensure that the system is not abused. Large volumes of nonduty hour traffic indicate a high probability that the system is being used for other

than official business:

b. WATS and FX services are generally less costly than FTS:

c. Less than optimal use is being made of some existing telephone services. The fragmentation of authority for long distance services between the 7th Signal Command and USARCCO contributes to the unintentional mismanagement of telephone services:

d. That LCR's will be required to ensure that optimum use of long distance circuits is made.

V-2. Recommendations.

a. That authority for all long distance telephone services be consolidated under one organization to ensure that all alternatives are considered in the determination of optimum trunking mixes and that, once in place, the trunking is used in the most cost effective manner. Without a single organization being responsible for long distance services, the trunking network will always be less than optimal.

b. That a vigorous program to identify and install optimum trunking mixes be established. WATS, FTS, FX, and other commercial services should be considered on an site by site basis. Combined savings from use of less expensive services at all Army CONUS locations should be between \$10M and \$15M annually.

c. That LCR devices be procured for those Army sites that will not receive digital switch upgrades prior to FY 87. Savings generated by use of less costly telephone services will easily cover the cost of the routing hardware. The LCR's can also be used to generate management reports that identify originators of calls. These reports should be very useful in efforts to identify and control abuse.

VI. CURRENT STATUS.

VI-1. Fragmented Long Distance Authority. The 7th Signal Command and USARCCO have agreed to consolidate traffic engineering responsibilities under USARCCO. The 7th Signal Command will continue to procure and fund WATS services but trunking mixes will be established by USARCCO.

VI-2. WATS and FX Acquisition.

a. Efforts to replace FTS have been primarily concentrated on installation of intrastate or band O WATS. Effective use of FX and interstate WATS services requires procurement and installation of LCR's.

b. LCR procurement has been scheduled to begin in FY 86. There is also an ongoing program to replace antiquated Army telephone switches with modern digital switches. The new switches will have call routing capabilities.

VI-3. Control of Abuse.

a. Cooperation of other MACOM's has been requested to identify and control abuse. The primary avenue of abuse control has been to restrict access to FTS trunks at night and on weekends.

b. By routing intrastate FTS calls via existing band 0 WATS and FX services and by restricting access to FTS during nonduty hours, FTS use has been decreased by about 70 percent at Fort Knox, KY. Fort Knox has an LCR, however, it lacks the capacity to interface all of the FTS trunks. WATS and FX calls are routed by the LCR and those calls are included in LCR-generated management reports. Much of the intrastate FTS traffic was apparently abuse and simply stopped after the intrastate traffic was rerouted via the controlled system. Savings generated at Fort Knox are approximately \$1.1M annually.

END

FILMED

1-86

DTIC